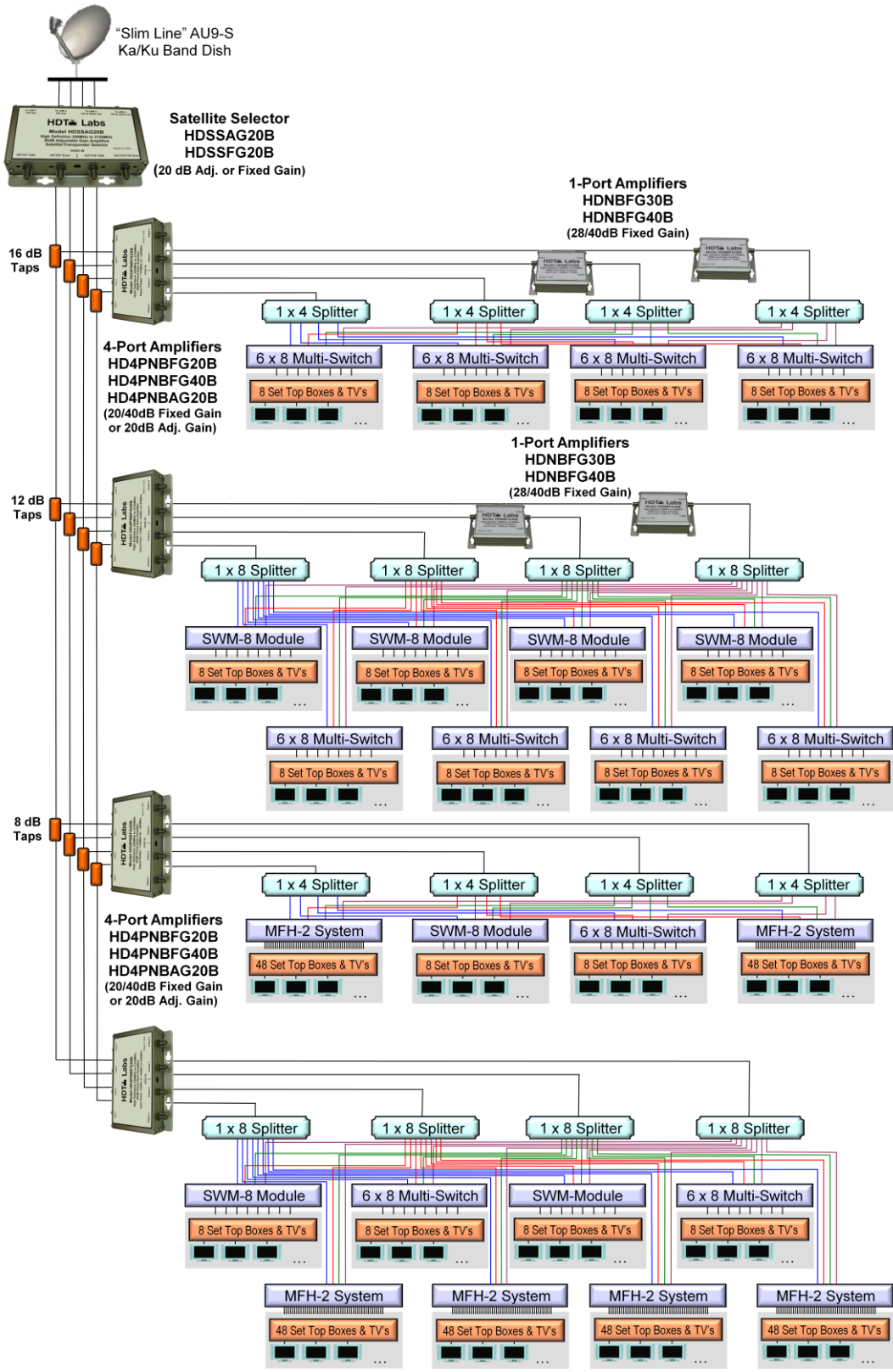


Typical HDTV Large Commercial Multi-Switch System Diagram for DIRECTV



Typical HDTV Large Commercial Multi-Switch System Description for DIRECTV

DISH ANTENNA

In most typical commercial installations, HDTV desired systems will usually use the "Slim Line" AU9-S Ka/Ku band dish (99°/101°/103°/110°/119°) for signal reception. The RF output signal level of the dish will vary between -19dBm and -28dBm, depending upon the model of LNB used. Recommended RG-6 coaxial cable will have a loss of about 10dB per 100' at 2150MHz, when the connectors and ground blocks used are rated to 2GHz.

SATELLITE SELECTOR

Since most commercial installations will have considerable signal loss due to the number of devices and cable runs in the system, a Satellite Selector should be used to optimize system performance. The **20dB Adjustable Gain Satellite Selector (HDSSAG20B)** is a combination of polarity locker, 20dB adjustable gain amplifier, and independent power supply that ensures strong and consistent control signals to the dish LNBS and adds signal strength to the system. Use the Adjustable Gain Satellite Selector to more accurately tune each of the four system channels and optimize the input levels to the next device.

Another Satellite Selector option would be our **20dB Fixed Gain Satellite Selector (HDSSFG20B)**. This device, when paired with the 20dB Adjustable Gain 4-Port Amplifier (HD4PNBAG20B), gives you both additional signal strength and variable gain control. Care should be taken in this case to not over-drive the Adjustable Gain Amplifier. Additional signal strength and variable gain control could also be achieved by using the Adjustable Gain Satellite Selector with either the 20dB or 40dB Fixed Gain 4-Port Amplifiers described below.

Connections from the dish LNBS can be to any of the four Satellite Selector input ports. Unused channels on the Satellite Selector do not require termination. Both Adjustable Gain and Fixed Gain Satellite Selectors allow you to build more reliable systems, use fewer parts, and produce a cleaner C/N output on all channels.

4-PORT AMPLIFIERS

When long cable runs as well as multiple taps and splitters significantly reduce the signal strength in the main lines of the system, using an appropriate 4-Port Amplifier can boost signal strength to the desired input levels required by multi-switches and receivers. Depending upon the amount of amplification required, three types of HDTV Labs 4-Port Amplifiers could be used. The **20dB Fixed Gain Amplifier (HD4PNBFG20B)** is great for general purpose use while the **40dB Fixed Gain Amplifier (HD4PNBFG40B)** would be used to overcome very large system losses. If precise gain control is

needed, the **20dB Adjustable Gain Amplifier (HD4PNBAG20B)** is ideal for setting the proper drive level to the next device.

Input power levels to all three amplifiers can be as low as -75dBm. Since the amplifiers can detect these very weak signals, longer cable runs may be used before amplification is required. This in turn can result in fewer amplifiers being needed in the overall system design. All three amplifier types have gain/slope networks built into each of their four channels. As system channel frequencies increase, so does the loss associated with that channel. The gain/slope circuitry essentially keeps the output signal at a consistent level across all frequencies by applying more gain at the higher frequency channels and less gain at the lower frequency channels.

SPLITTERS AND TAPS

Common splitters and taps may be used in any combination and number in order to produce the desired number of signal paths. Both splitters and taps introduce loss into the system and the resulting reduction in signal strength normally requires some sort of amplification.

1-PORT AMPLIFIERS

Inline amplifiers can be used to boost signal strength on long cable runs or lines containing lossy devices. The HDTV Labs **HDNBF30B is a 28dB Fixed Gain 1-Port Amplifier** well suited for these applications. If even more power is needed, the **HDNBF40B 40dB Fixed Gain 1-Port Amplifier** is capable of supplying it. Both amplifiers contain gain/slope circuitry and both operate in the 250 – 2150 MHz frequency range.

MULTI-SWITCHES

Large commercial installations can have any number and combination of 6x8 multi-switches, SWM-8 modules, and multiple SWM-8 modules built into MFH-2 systems. Although our diagram shows these various combinations in a simple manner, obviously the choices for a typical installation will depend on a number of different design factors. These multi-switch devices can all provide satellite TV signals from DIRECTV's five primary satellites to the inputs of multiple receivers.

The 6x8 multi-switch is commonly used in the industry and contains 6 input and 8 output ports. Four of the multi-switch input ports can be used by the output signals from the "Slim Line" Dish and an HDTV Labs' Satellite Selector while the other two input (Flex) ports can be used with separate dishes if satellites 72.5° and 95° are desired.

If the signal level at the input to the multi-switch is less than -35dBm, then additional amplification should be used. When the input signal levels at the receivers are -45dBm or less, you could experience

pixilation or 771 searching for satellite every time cloud cover impairs your dish. Hitting the multi-switch at the top of the input window will allow you to have the greatest output signal from the multi-switch. Use your satellite meter to make sure your C/N is greater than 11, typically being 16 to 17 on satellite 101° and 13 to 16 on satellite 119°.

SWM-8 Module

An alternative to the 6x8 multi-switch is the Single-Wire Multi-switch with outputs to 8 tuners (SWM-8). Both SWM-8 modules and 6x8 multi-switches have four main input ports and two “Flex” ports although the SWM-8 module also has an additional Off-Air input port. The SWM1 and SWM2 output ports combined can send signals to 8 tuners. If all 8 signals are used on SWM1, then port SWM2 should be terminated.

MFH-2 SYSTEM

The MFH-2 system consists of a six slot chassis designed to hold up to six Single-Wire Multi-switch modules (SWM-8). Since each of the SWM-8 modules has outputs to 8 tuners, a total of 48 tuner outputs are possible with each system. Multiple MFH-2 systems can also be linked together.

SET TOP BOXES, TV's, and DVR's

HR23 (HD + DVR), H23 (HD), R16 (SD +DVR), and D12 (SD) are the current models of set top boxes being used to receive the DIRECTV signal. The minimum input signal to each device by standards is a level of -51 dBm. Typically, this level should be no lower than -40 dBm, but for peak performance our recommendation would be to use an even stronger input level of about -30 dBm. This should result in the desired C/N ratio of about 16.

A single wire is required for each set top box and two wires are required for each set top box with DVR. If a SWM-8 module is used instead of a multi-switch, only one wire is required to the HD + DVR set top box. Legacy receivers can be used with both 6x8 multi-switches and SWM-8 modules if desired.